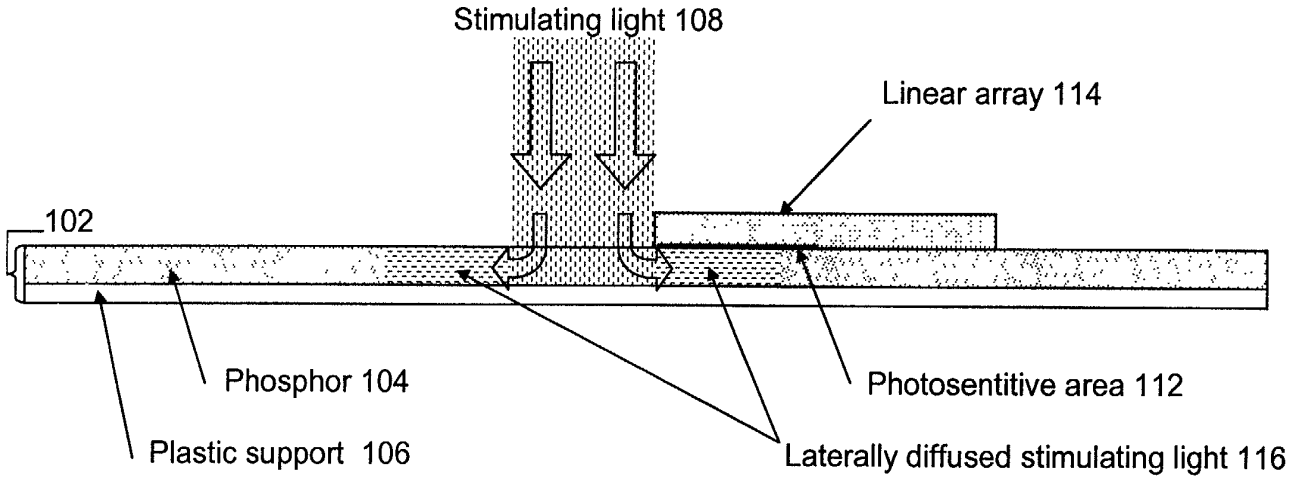


Fig.1

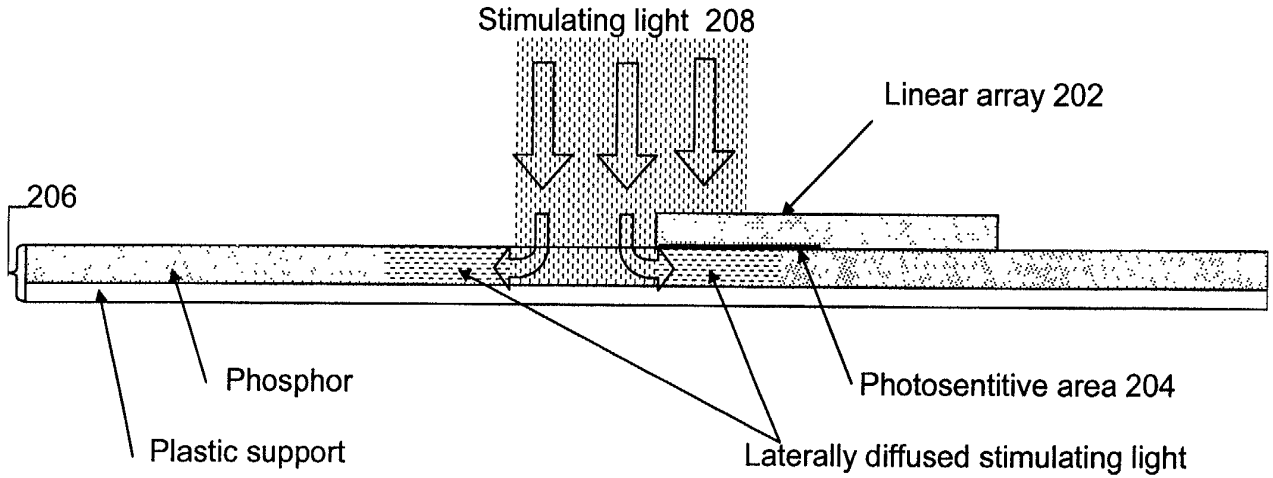


Fig.2

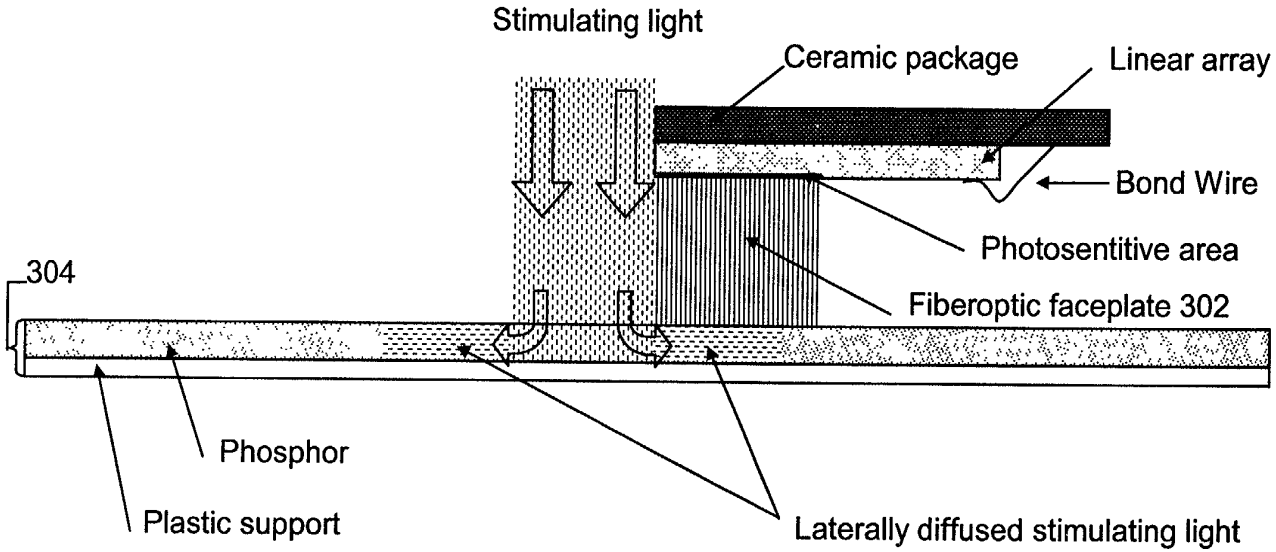


Fig.3

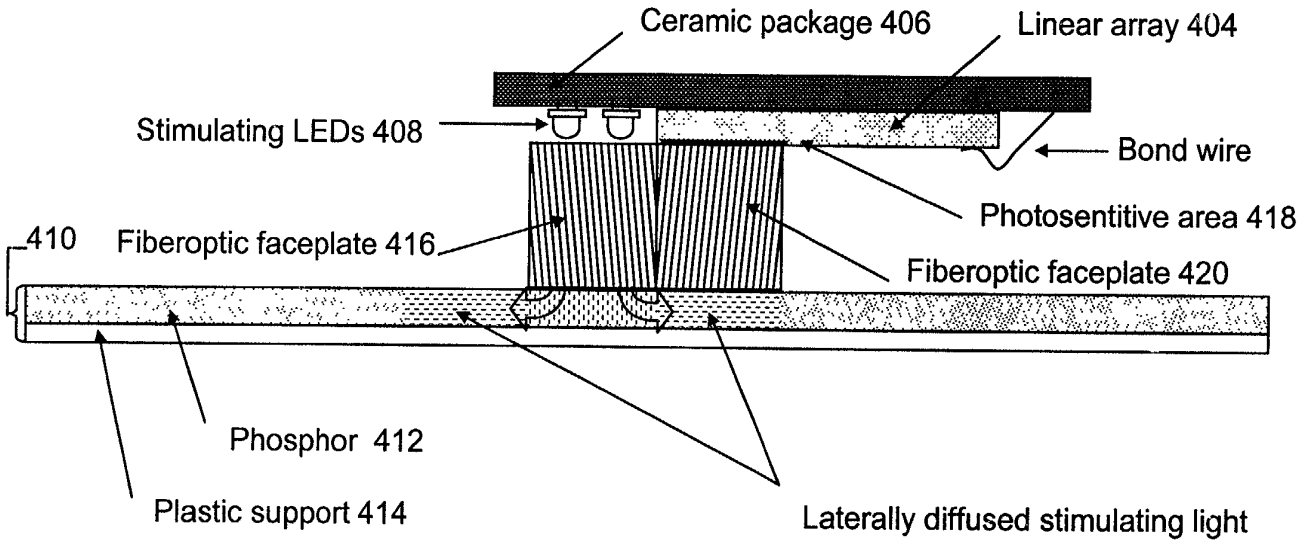


Fig.4

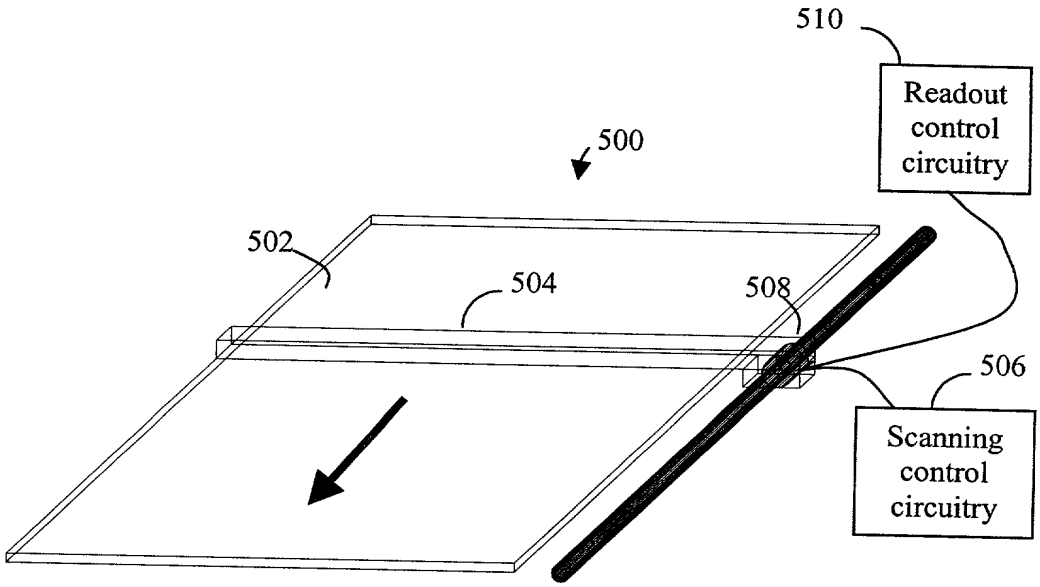

510
Readout control circuitry
500
502
504
508
506
Scanning control circuitry

Fig.5

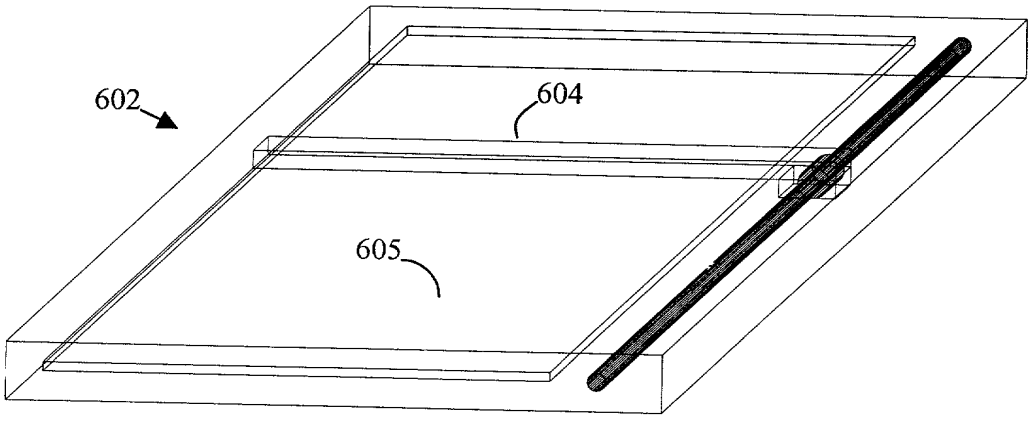

602
604
605

Fig.6

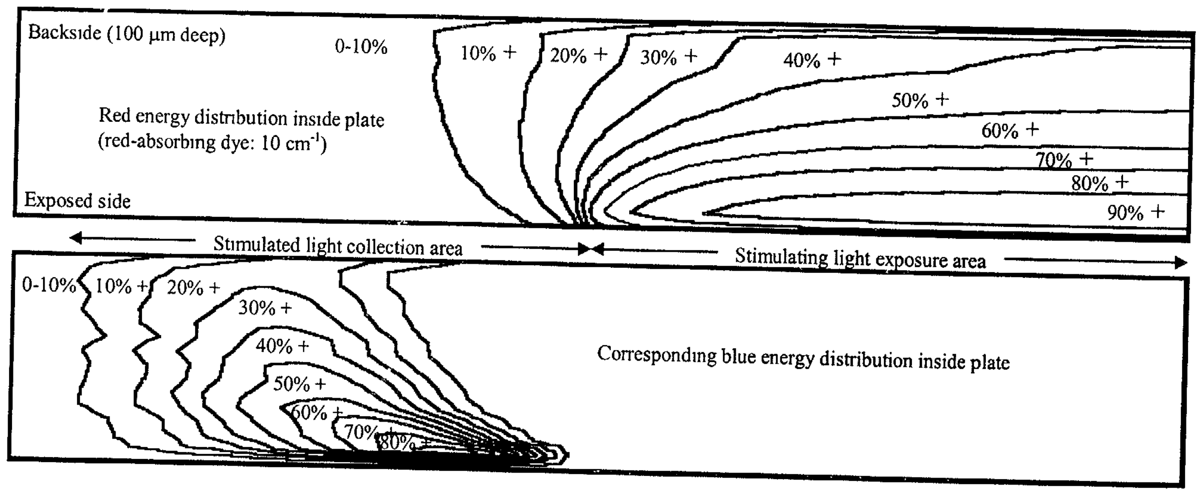

Backside (100 μm deep)
0-10%
10% +
20% +
30% +
40% +
50% +
60% +
70% +
80% +
90% +
Red energy distribution inside plate
(red-absorbing dye: 10 cm^{-1})
Exposed side
Stimulated light collection area
Stimulating light exposure area
0-10%
10% +
20% +
30% +
40% +
50% +
60% +
70% +
80% +
Corresponding blue energy distribution inside plate

Fig. 7a

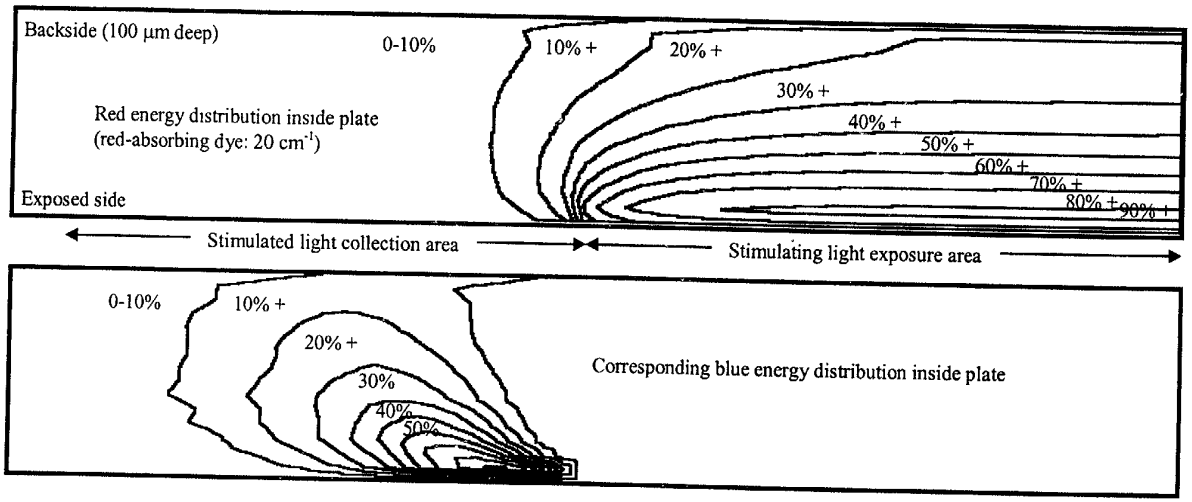

Backside (100 μm deep)
0-10%
10% +
20% +
30% +
40% +
50% +
60% +
70% +
80% +
90% +
Red energy distribution inside plate
(red-absorbing dye: 20 cm-1)
Exposed side
Stimulated light collection area
Stimulating light exposure area
0-10%
10% +
20% +
30%
40%
50%
Corresponding blue energy distribution inside plate

Fig. 7b

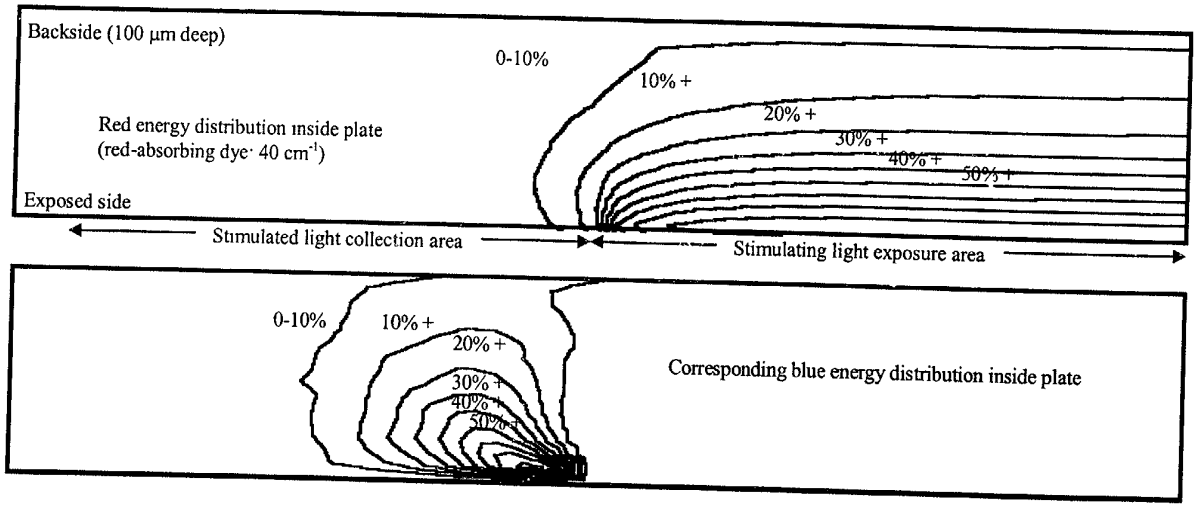

Backside (100 µm deep)
0-10%
10% +
20% +
30% +
40% +
50% +
Red energy distribution inside plate
(red-absorbing dye· 40 cm-1)
Exposed side
Stimulated light collection area
Stimulating light exposure area
0-10%
10% +
20% +
30% +
40% +
50% +
Corresponding blue energy distribution inside plate

Fig. 7c

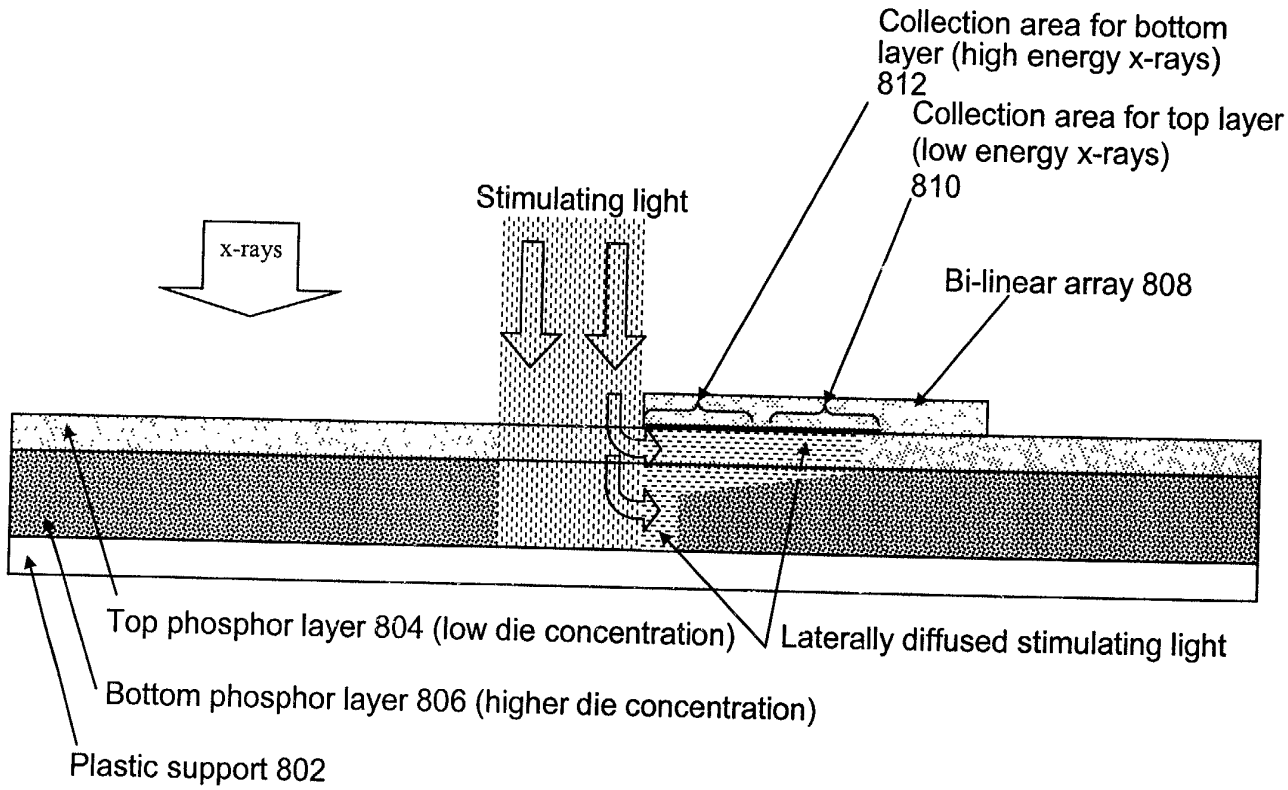

Collection area for bottom layer (high energy x-rays) 812
Collection area for top layer (low energy x-rays) 810
Stimulating light
x-rays
Bi-linear array 808
Top phosphor layer 804 (low die concentration)
Laterally diffused stimulating light
Bottom phosphor layer 806 (higher die concentration)
Plastic support 802

Fig. 8

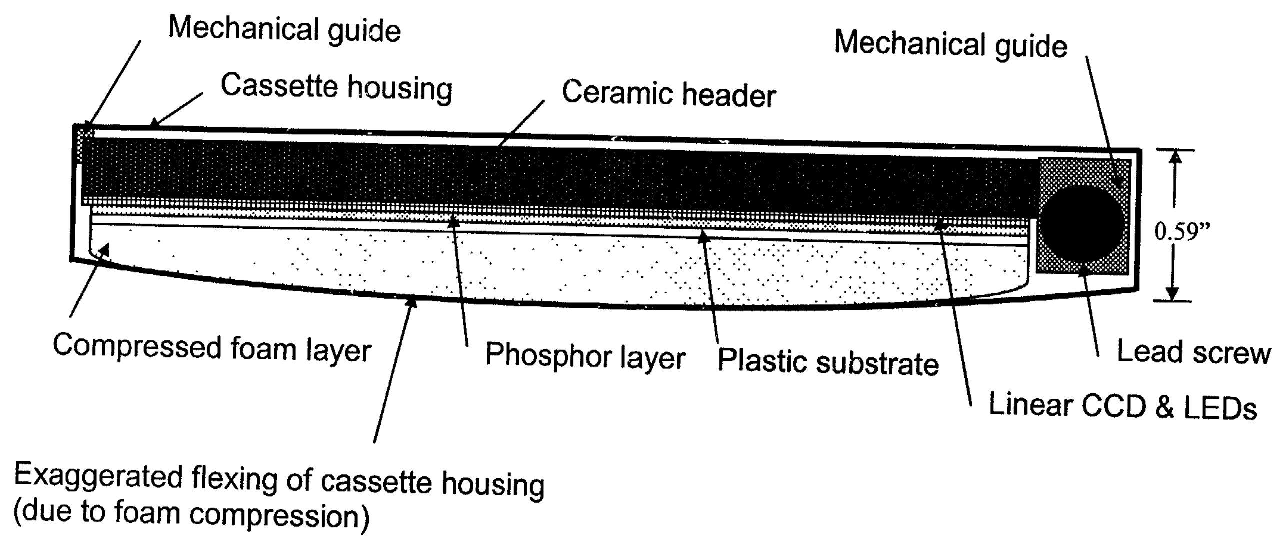

Mechanical guide
Cassette housing
Ceramic header
Mechanical guide
0.59"
Compressed foam layer
Phosphor layer
Plastic substrate
Lead screw
Linear CCD & LEDs
Exaggerated flexing of cassette housing
(due to foam compression)

Fig. 9

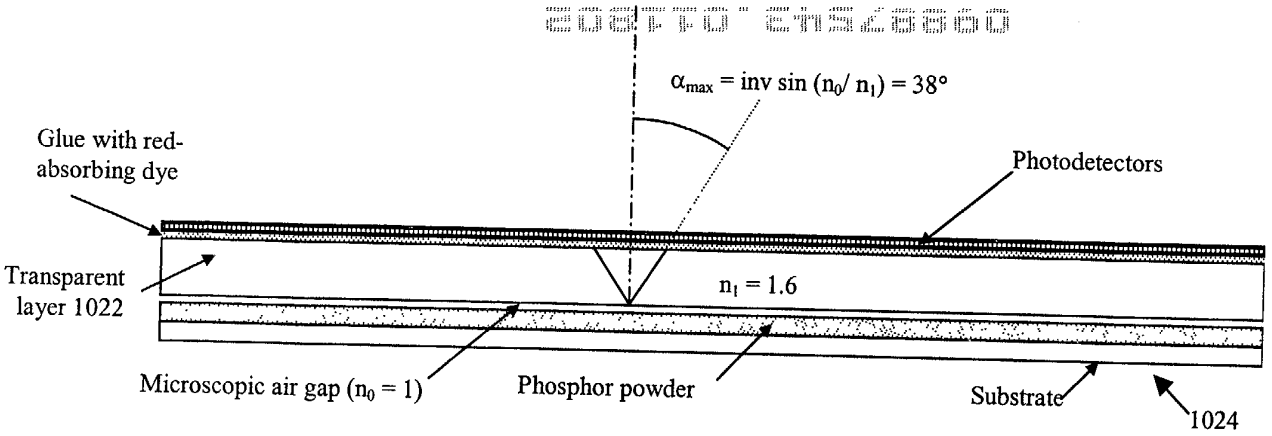


Fig.10 A

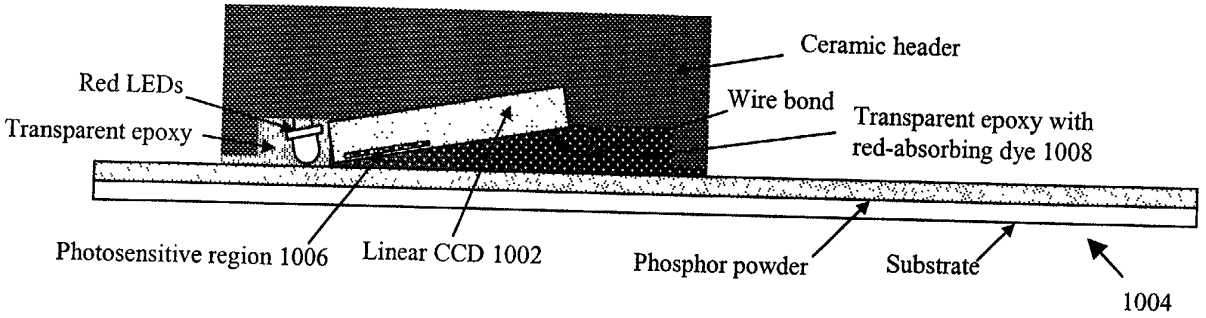


Fig.10 B

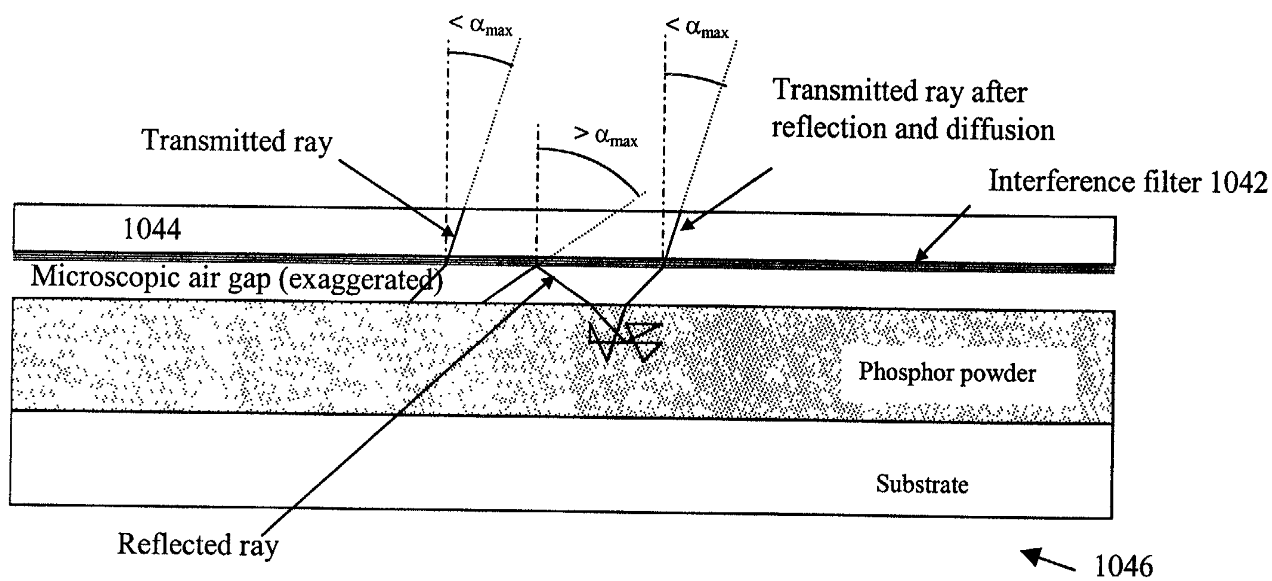

< α_{max}
< α_{max}
> α_{max}
Transmitted ray
Transmitted ray after
reflection and diffusion
Interference filter 1042
1044
Microscopic air gap (exaggerated)
Phosphor powder
Substrate
Reflected ray
1046

Fig.10 C

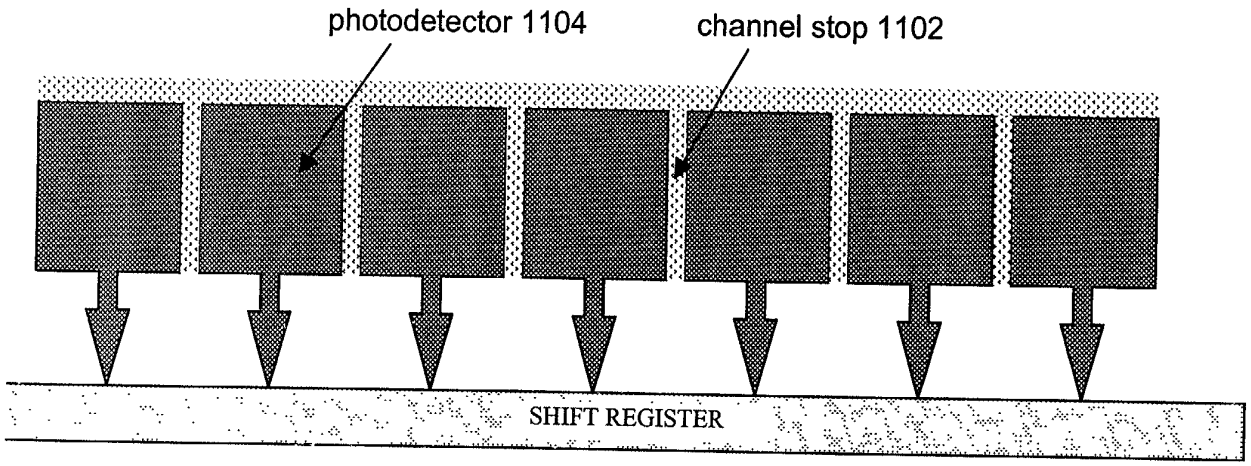


Fig. 11A
Prior art

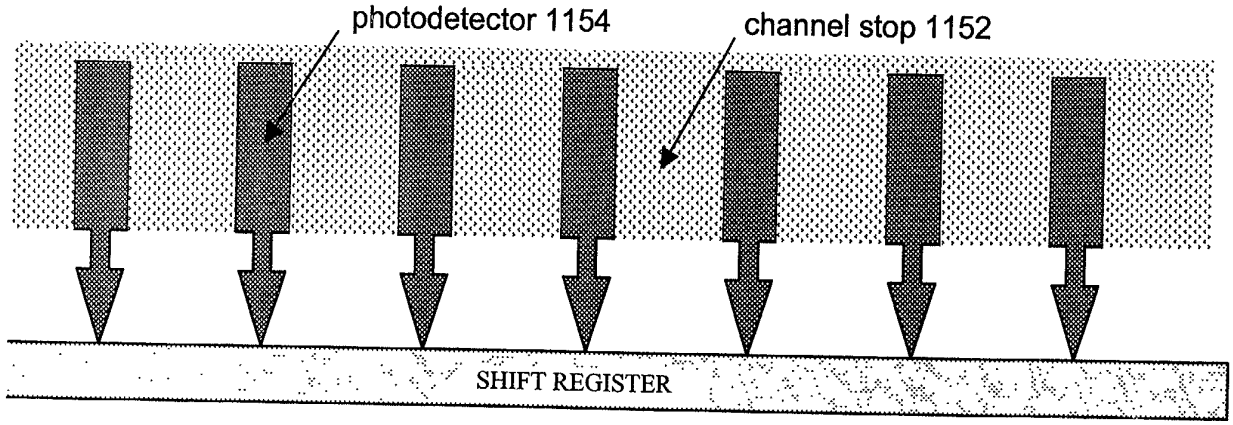


Fig. 11B
design

FIG. 12A Pixel response with narrow channel stops

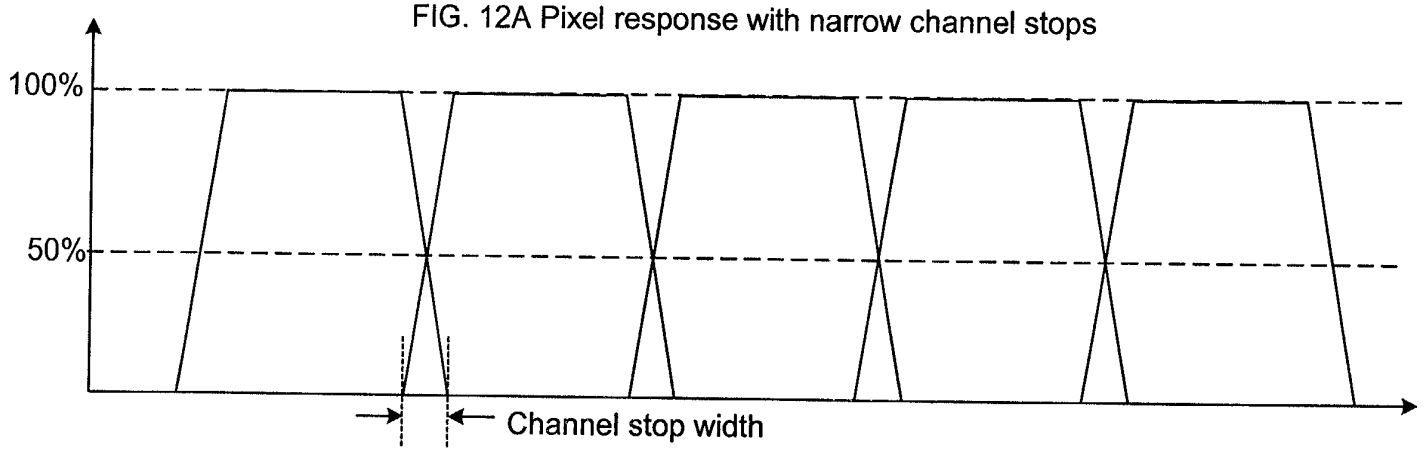


FIG. 12B Pixel response with wide channel stops

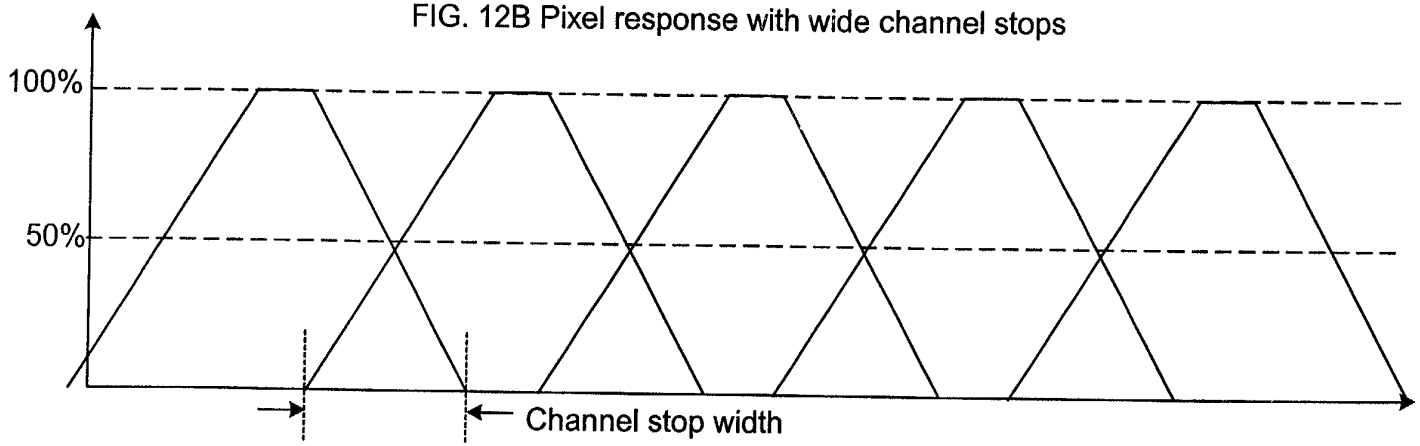


FIG. 12C Pixel response with 2x binning

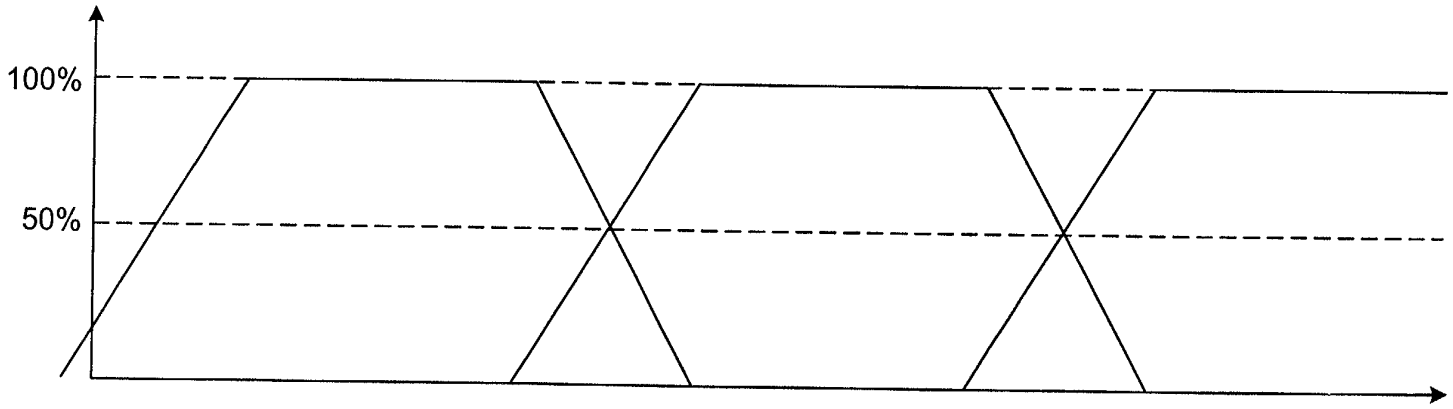
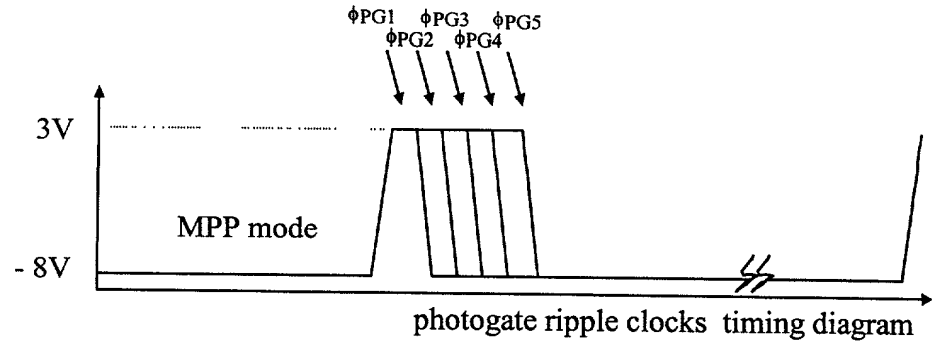
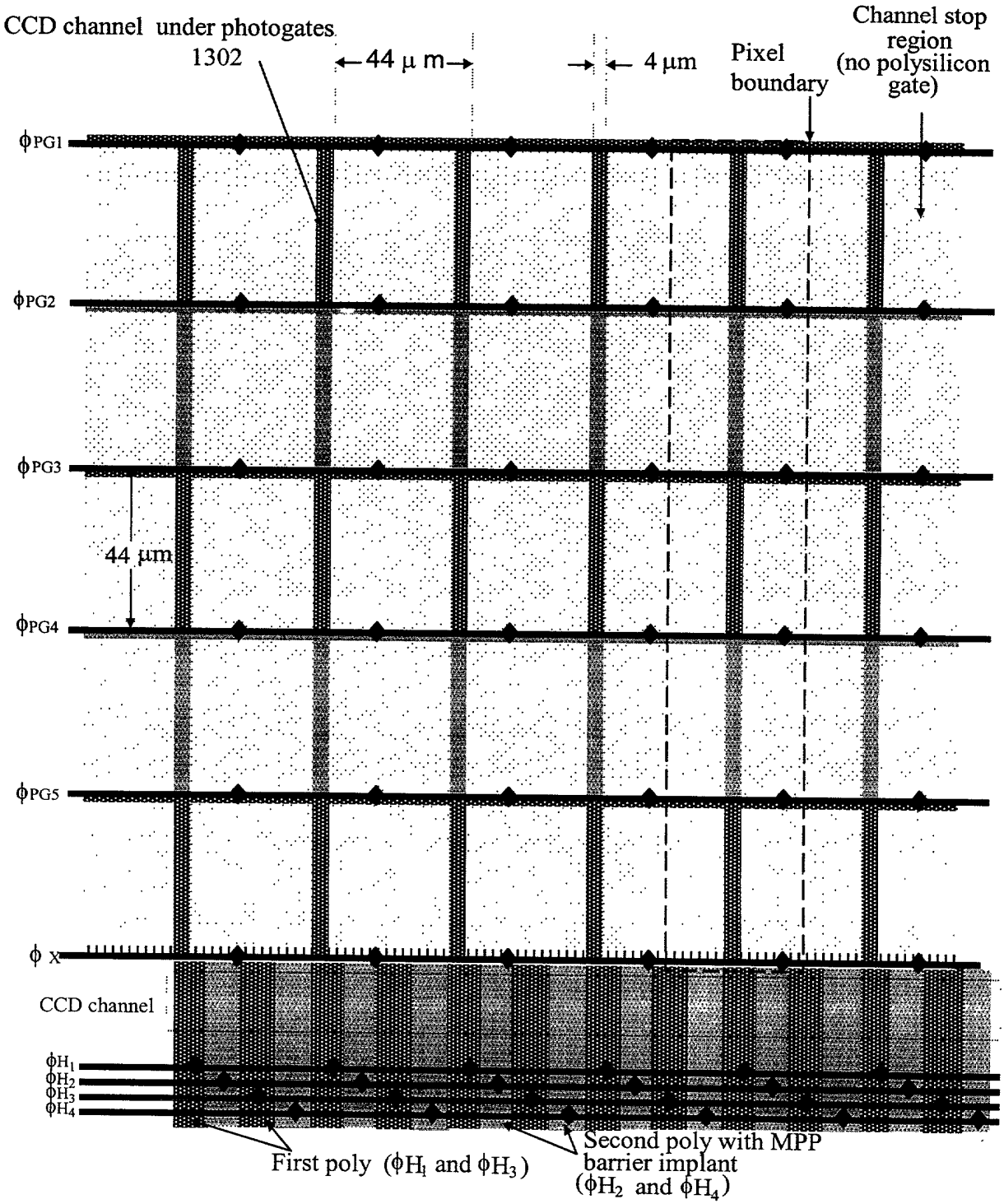


FIG. 13


ϕPG1 ϕPG3 ϕPG5
ϕPG2 ϕPG4
3V
MPP mode
- 8V
photogate ripple clocks timing diagram


CCD channel under photogates
1302
44 μ m
4 μm
Pixel boundary
Channel stop region (no polysilicon gate)
ϕPG1
ϕPG2
ϕPG3
44 μm
ϕPG4
ϕPG5
ϕ X
CCD channel
ϕH1
ϕH2
ϕH3
ϕH4
First poly (ϕH1 and ϕH3)
Second poly with MPP barrier implant (ϕH2 and ϕH4)

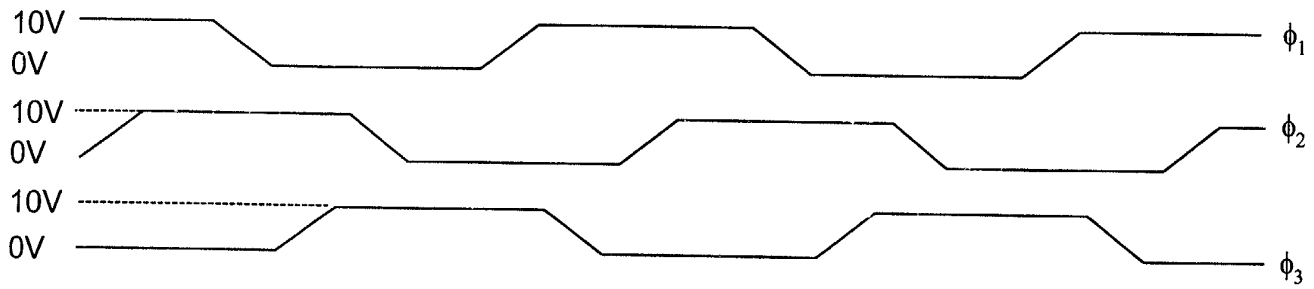


FIG. 14A Non-MPP continuous clocking of a 3-phase linear CCD

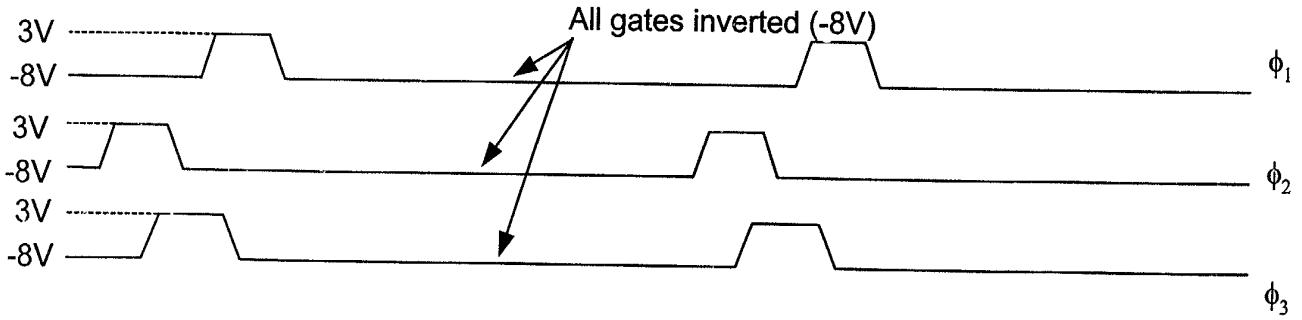


FIG. 14B MMP burst clocking of a 3-phase linear CCD

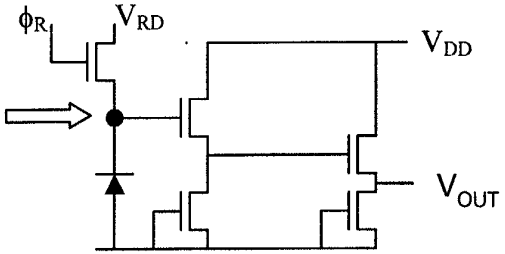


Fig. 15A dual-stage amplifier for linear CCD (prior art)

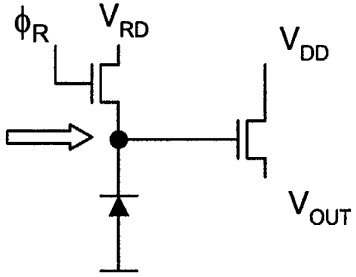
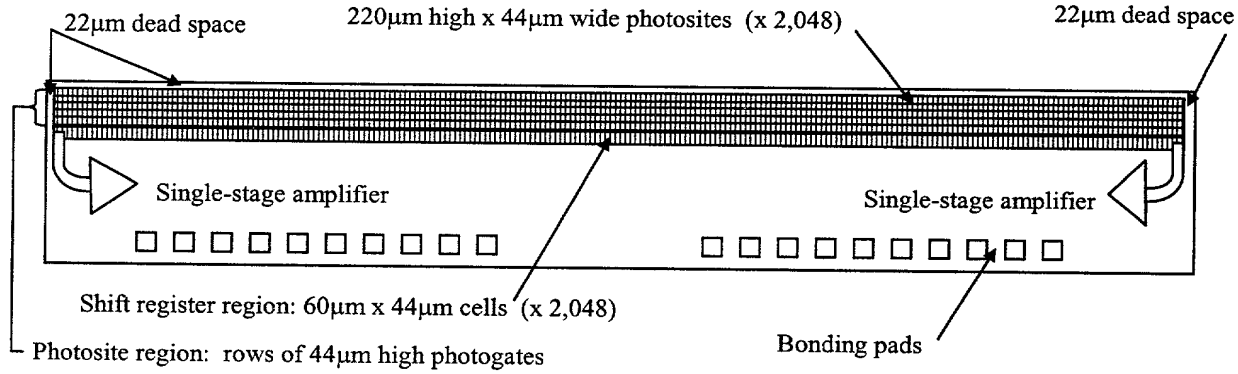


Fig. 15B single-stage amplifier for linear CCD

Fig. 18

Linear CCD specifications for storage-phosphor image plate reading

CCD architecture	Linescan (photosites & single register)
Photosite dimension	220 μm high x 44 μm wide (44 μm pitch)
Photosite design	5 photogates/pixel (44μm high x 4μm wide)
Shift register cell dimension	60 μm x 44 μm on a 44 μm pitch
Shift register design	2poly/2ϕ or 4ϕ switchable (with center split)
Shift register operation	Uni or bidirectional 2ϕ or 4ϕ (MPP mode)
Pixel count	2048 pixels
Die size	90.1 mm x 2.25 mm
Total dark current	< 20 pA/cm^2 MPP mode at 25°C
Shift register dark current (MPP mode)	25e$^-$/cell for 2ms integration at 40°C
Photogate charge transfer inefficiency (lag)	< 50e$^-$ at 1000 e$^-$ signal level
Well Capacity	10^6 e$^-$
Amplifier readout noise	5 e$^-$ at 250 kHz (single-stage amplifier)
Output configuration	1 or 2 outputs in split mode (opposite ends)
Effective Quantum Efficiency (uncoated)	> 50% at 400nm (63% QE x 80% FF)
Effective Quantum Efficiency (AR coated)	> 75% at 400nm (94% QE x 80% FF)
Open photogate fill factor (no poly coverage)	> 80%
Maximum readout speed	500 kHz
Binning	4x
Charge Transfer Efficiency	0.99999
Buttability	3 side buttable (< 22μm dead space)



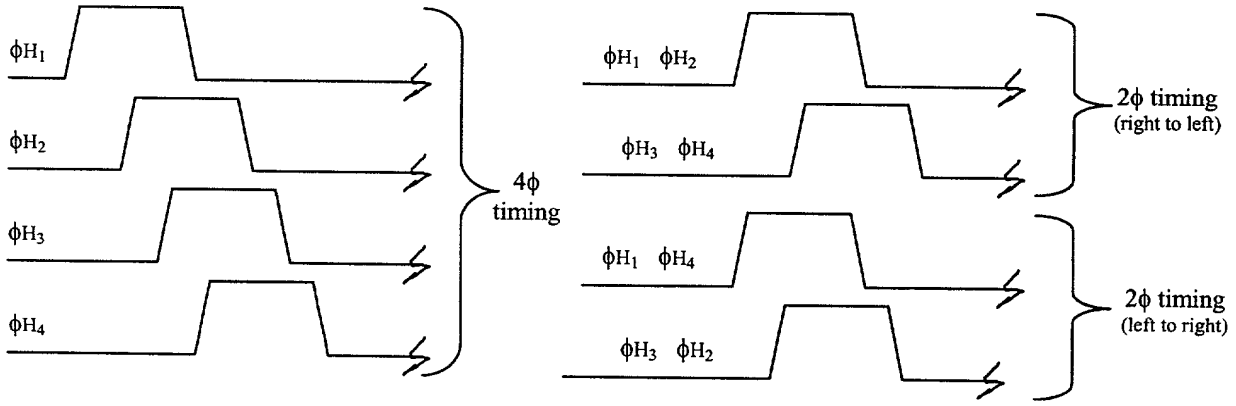
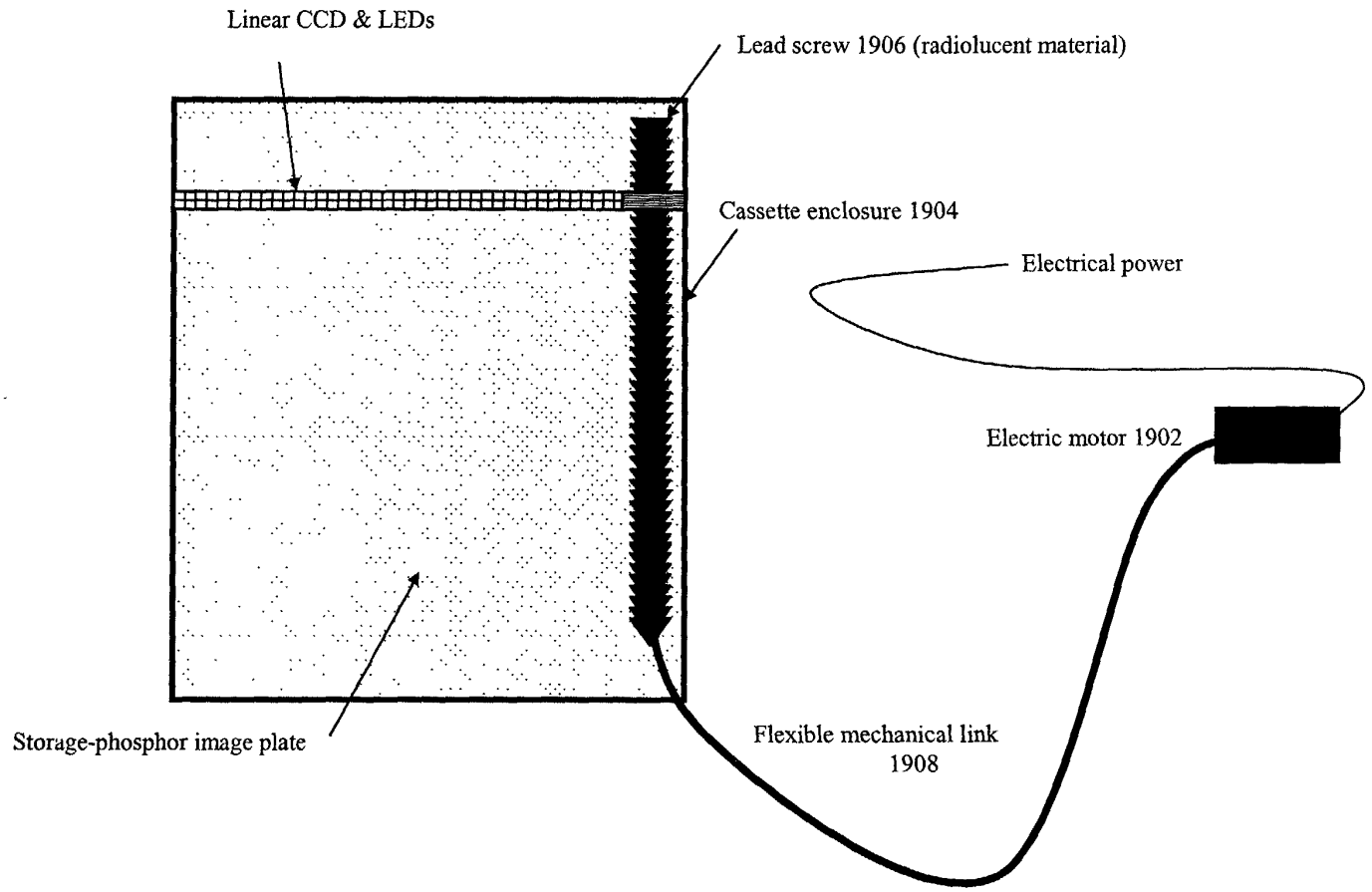


Fig. 19


Linear CCD & LEDs
Lead screw 1906 (radiolucent material)
Cassette enclosure 1904
Electrical power
Electric motor 1902
Storage-phosphor image plate
Flexible mechanical link
1908

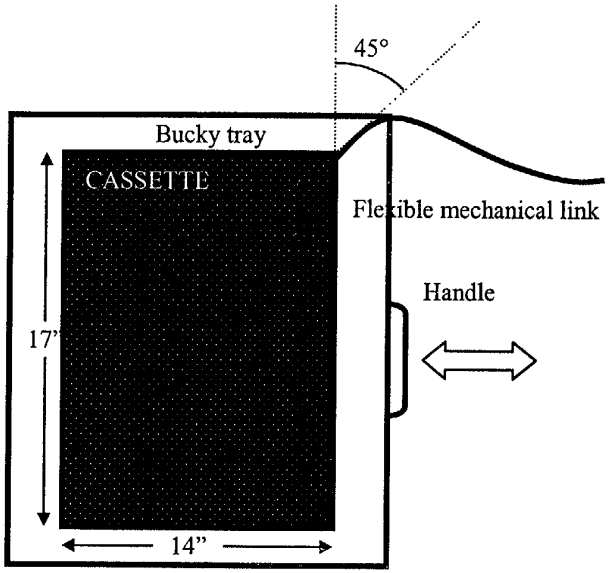


FIG. 20 A Portrait-mode cassette loading in Bucky tray

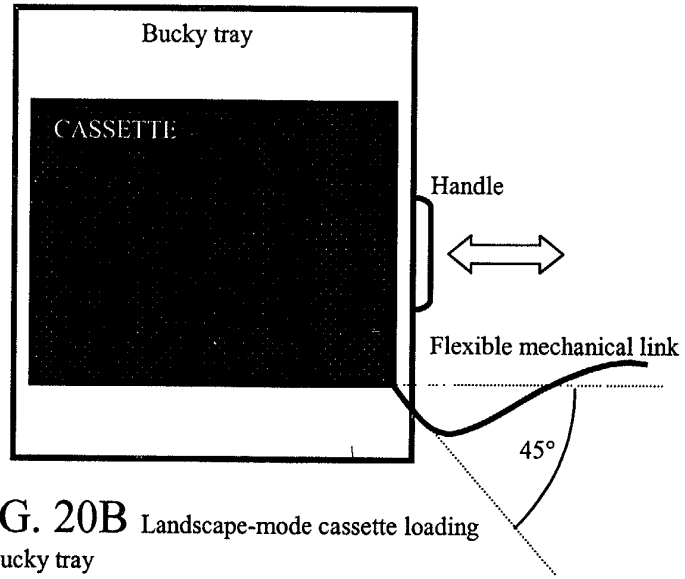


FIG. 20B Landscape-mode cassette loading in Bucky tray

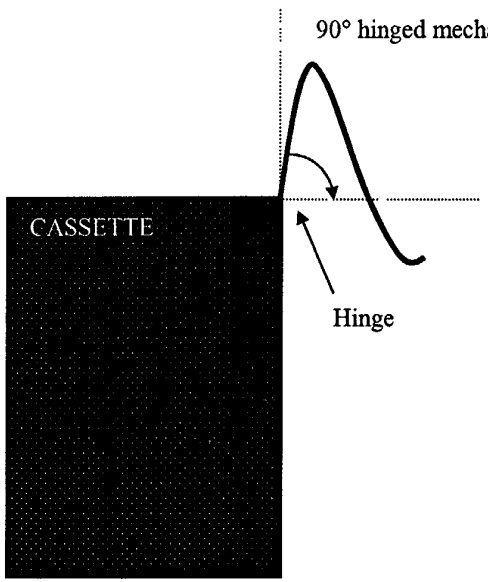


Fig. 21A

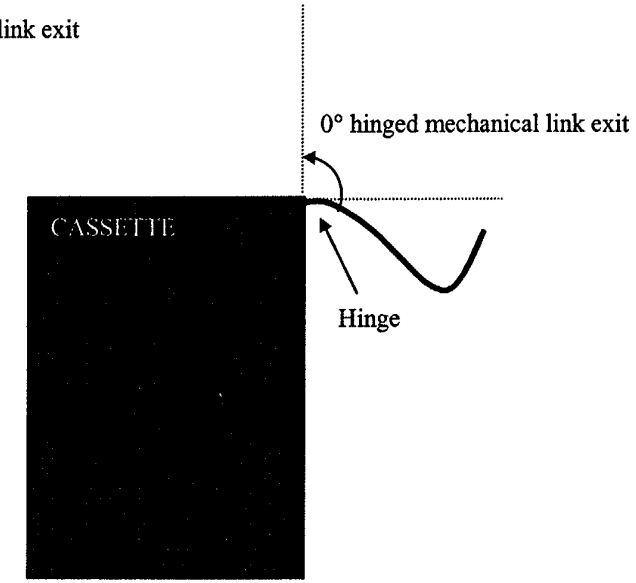


FIG. 21B

Fig. 22

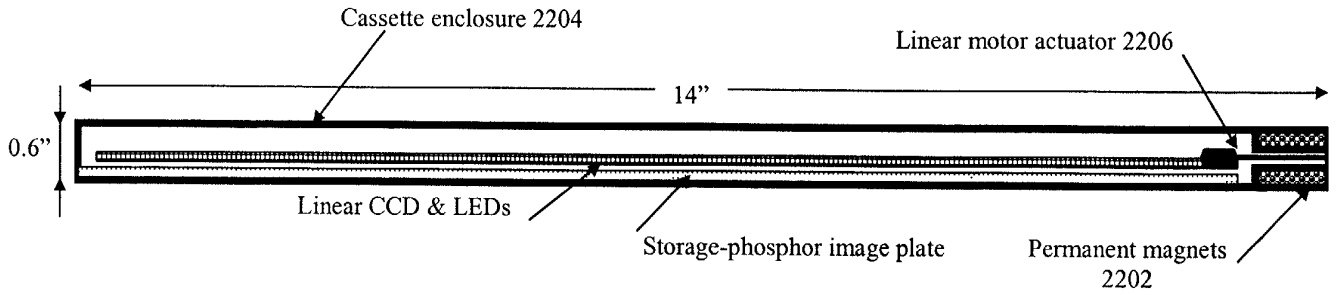

Cassette enclosure 2204
Linear motor actuator 2206
14"
0.6"
Linear CCD & LEDs
Storage-phosphor image plate
Permanent magnets
2202

Fig. 23

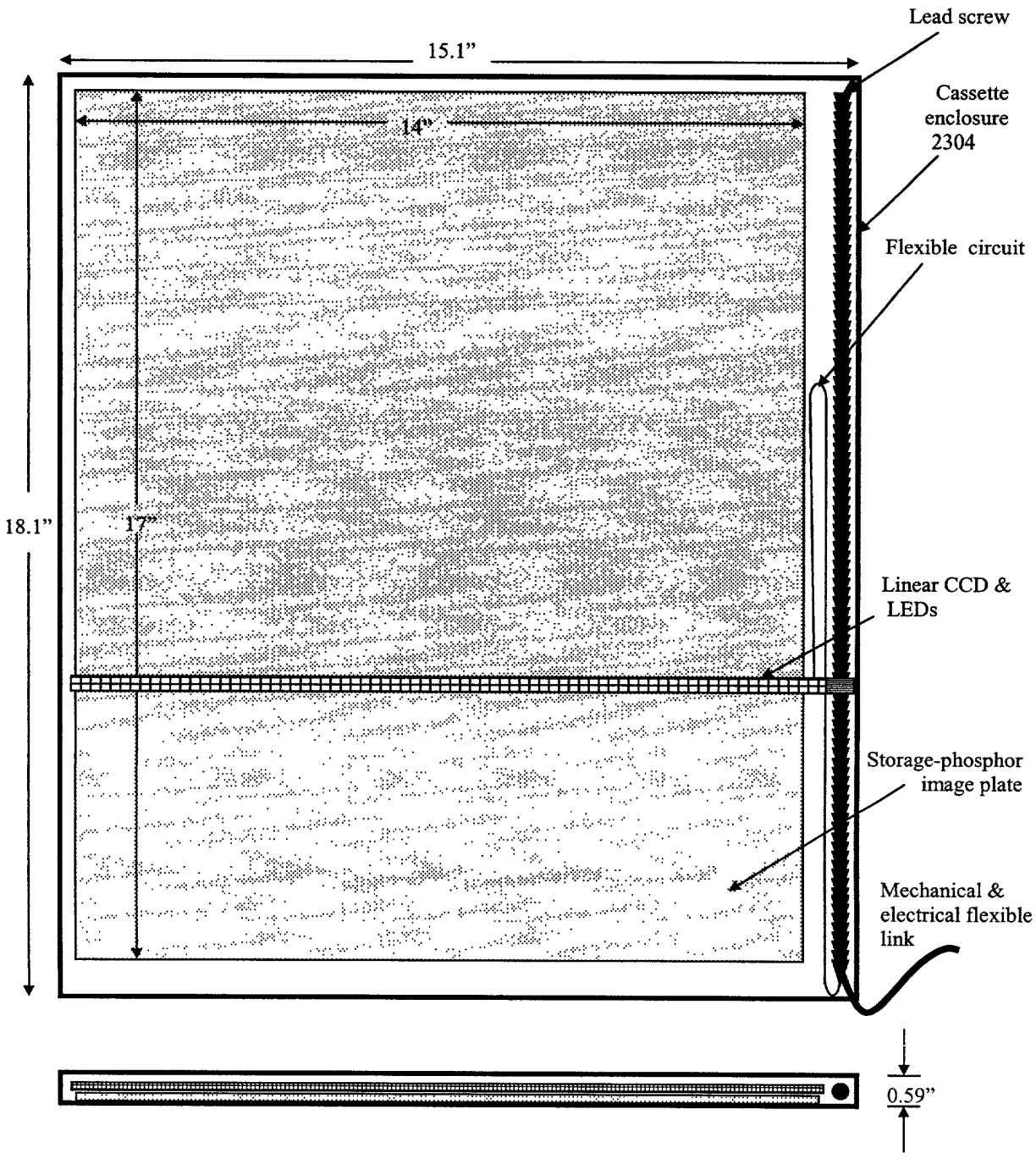
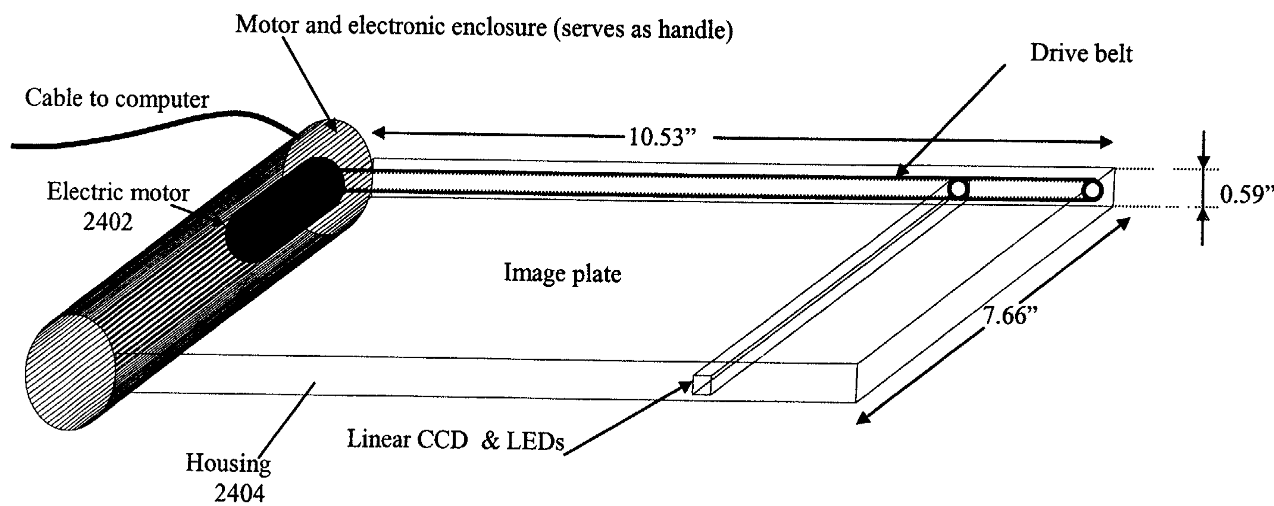

Lead screw
15.1"
Cassette enclosure 2304
14"
Flexible circuit
18.1"
17"
Linear CCD & LEDs
Storage-phosphor image plate
Mechanical & electrical flexible link
0.59"

Fig. 24



Mammography cassette enclosure (fits in standard 18cm x 24 cm bucky)